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# NATIONAL AIR INTELLIGENCE CENTER


FROM EIGHTH ROUTE ARMY TO SCIENTIST

by

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# HUMAN TRANSLATION

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On a balmy spring day in 1986 rounds of applause and shouts arose from the conference room of the Ministry of Space's 701 Institute at the foot of the Xishan Mountains.

"I would like to present Professor Qian Xuelin with flowers to express our congratulations on his being selected as a vice chairman of the All China Peoples Political Consultative Conference." These words were spoken by the deputy director of the institute, Yu Jingyuan. Then, two young graduate students presented a bouquet of fresh flowers to Qian Xuelin. On this day, Song Jian had personally asked his assistant, Lu Dianyuan to send a letter of congratulations. In his letter he said, "On this day when the Party and people are giving the recognition deserved to an outstanding scientist who has made major contributions, we would like to express our heart-felt congratulations!"

On this day, seventy five year old professor Qian Xuelin wore a brand new green uniform. His spirits were high and his face was shining. He sat uneasy amidst all the clapping and shouting, and he was moved to stand. He walked up to the microphone and said: "Thank you, Comrades. I have done nothing that any older generation scientist should have done. There is nothing worthy of all this congratulations." He was silent for a moment, and then continued, "If you want to congratulate someone, I suggest that you congratulate an outstanding scientist who is younger than I, he is Comrade Song Jian.

Those scientists and graduate scientists present all approved of these words by Qian Xuelin. Qian Xuelin's congratulations to

Song Jian were well deserved. There are a number of coincidences which happen from time to time. Shortly before Qian Xuelin was selected as a vice chairman of the Chinese Peoples Political Consultative Conference, the Chinese scientific community was stunned to hear the news that the chairman of the Academia Sinica, famous control theory scientist, Song Jian, had been named as a member of the State Council. After rising to leading positions in the scientific world, Song Jian and other comrades had proposed the famous "Spark Plan", thus having science and technology organizations, just like local cadre and the masses, take science and technology to Taihangshan. Recently they had also organized a help-the-poor science and technology fact finding team to Dabieshan.....

The name Song Jian is no stranger to control theory experts in China and around the world. However, they probably never thought that this scholar who has made outstanding contributions in the field of control theory had a legendary history.

On the shores of the vast Yellow Sea, there is a place called Rongcheng. This beautiful coastal town was no paradise in the forties, but was as poor and desperate as the rest of the China Mainland. When the smoke of the resistance against the Japanese army of aggression arose all over China, the people of Rongcheng had feelings of patriotism crashing in their chest, like the waves of their neighbor, the Bohai Gulf. During those tumultuous times, 14 year old Song Jian bade goodbye to his home town of Rongcheng and joined the Eighth Route Army. No matter where the fighting led, if he had time on his hands people would find this boy soldier with his head buried in a book. He was especially fond of reading about science and reading literature. The unit leader saw he was studying so hard, and after liberation, he was sent to study at Haerbin Industrial College. In college, Song Jian studied

extremely hard, and studied Russian on his own whenever he had a little bit of free time, even when brushing his teeth and washing his face. One morning, he was listening to the radio while he was brushing his teeth, and when he suddenly discovered that he could actually understand the Russian in the broadcast, that he was moved to tears.

He finished his first year with outstanding grades, and passed a test to go to the Soviet Union to study there. During the four years he studied Artillery at the Baoman (phonetic) Industrial College he arose even earlier and went to bed even later. He studied very hard and passed every examination easily. When he graduated, the school gave him a gold medal, and recommended him to be a graduate student under the famous control theory scientists Feiliedebaomu (phonetic). While a graduate student, Song Jian went to bed even later. In addition to completing in an outstanding manner the research assigned by his advisor, he also lectured to Soviet Union college students and students from abroad in a class on modern control theory, becoming one of the few Chinese who ever taught a class in the Soviet Union. At the same time, he still had not forgotten his own studies, and every night he went to the Moscow College to study at the math and physics departments there. While riding on the subway, he would miss his station because he was too absorbed in solving one of his math problems, ending up going in circles. Through superhuman efforts, Song Jian finally finished all of the courses in math and physics, receiving a second college diploma, laying a solid foundation for future theoretical research.

While a graduate student studying in the Soviet Union, Song Jian suddenly became an internationally known scholar. In a few wears he published six papers in Russian, for the first time solving optimum control design in three dimensional space,

establishing the dual parameter optimum control theory and completing experiments with actual objects. A number of his theories were included in his Advisor's "Optimum control system theory. Later, Soviet Academy of Science scholars and American professor E.B. Lee used these achievements in their papers. Song Jian established the theory of the isochronic field of optimum control, making him one of the first few scholars to raise this concept.

In 1956 Qian Xuelin overcame a number of obstacles to return from the United States to China, quickly joining the work to begin the development of guided missiles. He and Song Jian had never met, but he had kept up with Song Jian's successes. When someone praised him on his work in control theory, he would say with humility, "not me, the best man in control theory is not me, it is Song Jian!"

After a number of years of studying hard, Song Jian received an associate doctorate in the Soviet Union. However, a number of scholars were convinced that judging from the level of his thesis, he had already attained the doctorate level. His advisor also made the preparations for him to defend his thesis. It was at this time that there was a sudden decline in Sino-Soviet relations. Song Jian, who had grown u under the tutelage of Party unhesitatingly obeyed the decision of the party and abandoned this once in a lifetime change and quickly began his journey back to China.

Upon returning to China, Song Jian reported for work at the Second branch Academy of the Former Fifth Academy of the Ministry of Defense before he had even had a chance to recuperate from his journey. Along with other scientists, he began work on developing missile weapons systems. In four years, he was in charge of the overall design of China's first generation surface-to-air missile

control system. At that time China was just beginning its work on missiles. He and his co-workers solved all kinds of technical difficulties through repeated exploration and experimentation, and successfully carried out the design, testing and model fixing of the missile control system. It was Song Jian who was the first to use optimum control theory in missile control systems design. He also used the time-optimal control theory to solve the problem of high speed introduction of initial guidance. The "Coordinate Conversion in Missile Control", which he edited, not only played a guiding role in the development of surface-to-air missiles, but to the development of surface-to-surface missiles and air-to-air missiles. While he was having these successes, he enthusiastically personally taught classes, training China's first generation of scientific and technical personnel who would work in missile guidance system design research. Also, together with such scientists as Qian Xuelin, Hua Luokang, Guan Qizhi, he created China's first control theory laboratory which played a pioneering role in promoting and developing China's scientific research into modern control theory.

Song Jian will never forget the fall of 1963 and the convening of the Third Session of the International Joint Conference on Automated Control in Switzerland. China only presented one paper from Song Jian. It was personally selected from such older generation scientists as Qian Xuelin and Guan Qizhi. The title of the paper was "Analysis and Synthesis of Linear Time-Optimal Systems". At this conference, thirty-one year old Song Jian, the youngest delegate attending, reported to the more than one thousands scientists attending this paper which he and fellow scientist Han Jingqing had completed. The scientists at the conference posted fliers concerning this event, and famous American scientists Lasai'er (phonetic), Niusida (phonetic) and Zhang Shoulian could not say enough in praise of this unique research

achievement of China. After they heard the reading of this paper, they went to the quarters of the China delegation to offer their congratulations.

Young Song Jian was unaffected by all this, and shortly after returning to China, another more difficult task was placed upon his shoulders. "Engineering Control Theory" is a well known book by Qian Xuelin. The English language version published in 1954 was sold all around the world. The Russian language version was published in the Soviet Union in 1956. Qian Xuelin assigned the tremendous task of revising this book, known around the world as a classic test in control theory, to the relatively unknown Song Jian. Song Jian was happy to be assigned this major task by Qian Xuelin.

At this time, China was urgently proceeding with defense science research. Chairman Mao point out that: "If there is a spear, there must be a shield". That is to say, that if there are missiles, there must be anti-missile missiles. "If it can't be done in five years, do it in ten. If it can't be done in ten years, do it in fifteen." but China must develop anti-missile missiles. During the day, Song Jian concentrated all his efforts in overseeing the development of an anti-missile missile. After work, he revised Qian Xuelin's book. This arduous task was not completed in a single day, or in one year, but more than ten years of vacation days and nights were spent revising this book. He would often begin at ten at night and work until one or two in the morning. The final result was to expand this 400,000 character book to 1,200,000 words. It was published in two volumes by the Scientific Press.

Qian Xuelin stated that "as a scientist, Song Jian has a great deal of research talent, and as a technician, he also has the

ability to solve practical problems. This is something that is beyond the capability of most people."

One day, Song Jian handed the revision of "Engineering Control Theory" to Qian Xuelin. After reading over it carefully, Qian Xuelin exclaimed, "This book will be published in the names of you younger scientists. You have done a great deal of work. We have to put a stop to this old practice of only older generation being able to publish and learn from Premier Zhou!"

But Song Jian disagreed. He said, "Mister Qian, we only did a little bit for you. Only your name should be used."

"No, my name cannot be used, only as the original author at most," maintained Qian Xuelin. Finally, Qian Xuelin wrote in the forward: The authors of this new edition of "Engineering Control Theory" are China's young control theory scientists. They, and especially Comrade Song Jian, have taken the lead to organize and personally write the draft, completing the vast majority of the work. They are the creators of this new edition."

In order to In recognition of the outstanding contribution toward control theory made byby Qian Xuelin and Song Jian, "Engineering Control Theory" was awarded a prize for the outstanding scientific work in 1982.

In the middle sixties, a new page was turned in China's military scientific research. The Central Military Control Commission decided to develop an anti-missile missile. This is the most technically complicated of all missile weapons. Chief designer Song Jian accepted the task of establishing the institute. Just as he was working day and night to provide guidance for this anti-missile missile development, the ten years of chaos began. He

was labelled a "revisionist seedling", and was subjected to extreme criticism, was placed under investigation, and later he was labelled a "mole" and a "revisionist". His home was ransacked..... Late one night in 1968 he suddenly turned up "missing". His wive, Wang Yusheng, was extremely frightened when she heard that her husband was missing. Suddenly someone sent her a note penned by Song Jian. She took the note and read it, and it was like a heavy load had been taken off her shoulders. Song Jian had been placed under the protection of Premier Zhou, and had been sent to a certain missile testing base. He was going to the library at the base to teach himself astronomy, quantum mechanics, atomic physics and high velocity aerodynamics. He also did a great deal of practice problems and taken a lot of notes. During that time when right and wrong were turned around and when truth and justice were violated, Song Jian maintained his belief that this was only temporary. The people would have to move on, and the country had to be prosperous and strong. This was an irreversible current of history. It turned out just as he believed. On day, word came from Beijing. Song Jian had to be let out to handle a task. A few days later, Song Jian was on his way back to Beijing.

When he returned to his post, he paid no attention to all the suspicions, but together with Yu Jingyuan and Tang Zhiqiang, he dared risk "only carry out production and not revolution". Once a week they would get together and study and solve such problems as missile control and distributed parameter theory.

"Don't pay any attention to them. Pay attention to our missile plastic vibrations. Perhaps they won't accept our work, but this is science, and it will eventually be accepted!" Said Song Jian to encourage the other. A the time he was head of the technology department of the Ministry of Space's Second Academy, but he did not act in the least like a boss. He always acted like

another comrade and discussed problems with others as if everyone were equals. This gained him the respect of everyone. Once, Song Jian was hospitalized with an illness. He had his wife, Wang Yusheng, ask Yu Jingyuan and the others to come to the hospital to see him. All of them came to the hospital to see Song Jian lying on his bed hooked up to an intravenous bottle. He had a book propped up on his chest and was reading it. Song Jian also seemed no have forgotten he was sick, and he struggled to sit up and had a heated discussion with his coworkers on the theories of missile plastic vibration.

Under extremely difficult conditions, Song Jian plodded through the winds and waves to lead a number of young people in the successful completion of the overall design of China's first batch of anti-missile missiles as well as the technical design and models, and the design, testing and flight testing of an independent mesh missile. During that time, he also taught himself English. He would always carry a small note pad with him which he had filled with all kinds of English words. He would memorize them when ever he had some spare time. At times, he would ride his bicycle to The Beijing Library to look u some reference material or read some books, and once there he would be there for half a day at a time, and when he got hungry, he would leave his bicycle at the side of the road and eat some meat dumplings at one of the small roadside stands and then go back to the library. Once back at the institute, he would organize a discussion class. In 1975, Song Jian published a famous thesis "Distributed parameter control system with an ordinary differential controller" in "CHINA SCIENCE". After the foreign language versions of this paper were published, it stirred up a heated reaction around the world. A number of foreign colleges and institutes all wrote asking for copies of this paper.

During the years of chaos, even though he was enthusiastic about his work, he did not receive the compensation he deserved. In 1976 he was sent down to a cadre school in a rural village. When he arrived at the cadre school, he continued his work and studies as usually. During the day, he carried out the physical activities with everyone else, and when night came, or when he had a day off, he would study English from radio broadcasts or he would read novels in English. When he had time he would also think over how to solve the problems of different problems in missile flight. Although he controlled his own feelings with an immense amount of self control, deep in his heart he had a great deal of sorrow. The actions of the "Gang of Four" caused him concern over the fate of the Party and country. One Spring day in 1976, on a rainy cold morning, his coworkers arrived for another discussion in his small room as they had done before. They knocked on the door, but no one answered. They pushed open the door, and saw Song Jian with his head in his hands and elbows on the table crying over the death of Premier Zhou.

After the fall of the "Gang of Four", Song Jian was like a fish back in water, and returned to his post he had been longing for day and night. He under took being the first assistant general designer of a solid fuel missile launched by a nuclear submarine. He also was named deputy director of the Ministry of Space Second Academy. He did a lot of work in leading the scientific and technical personnel to develop a new model missile as fast as possible. He actively assisted the design engineer, Huang Weilu to quickly deal with and solve a number of key technical problems. In 1982 was also an unforgettable year for Song Jian. The "Julang-1" solid fuel submarine-to-land missile he and all the others had spent a number of years working hard on developing was successfully launched.

Beginning in the seventies, Song Jian began working on solving the plastic vibration control problems of flight vehicles. Working together with mathematician Guan Qizhi and others, he established a distributed factor system control theory. He first proposed and established a mathematical model for plastic vibration control, and also proposed a design theory and design program for a flight vehicle automatic pilot, as well as other series of related control theory problems. This work was awarded a national natural science prize in 1982. The scientific community in China and abroad rated these research achievements of his very highly, calling them "certainly of major importance in the realm of natural science." Experts in automatic control from England, France, the United States as well as India, Mexico and Japan stated the Song Jian's research work and his going to other countries to lecture had gained recognition for China.

Along the road of constant search and exploration, Song Jian has left one monument after the other. Since the late seventies, he has produced another scientific idea: How to use control theory in social economic systems. After this, he also used his spare time to lead a team in studying how to control China's population growth using control theory, system engineering and computer technology. After years of efforts, they established a mathematical model of China's population, for the first time coming up with a 100 year projection of China's population. Later he also came up with population projections for more than 20 provinces, cities and autonomous regions. These achievements provided a scientific basis from which the Party and government could formulate population policy. The United States famous population scholar Kao'er (phonetic) praised Song Jian in his academic lectures, saying that "Song's research is different from our western research methods". His research "shows a high level of theoretical mastery".

Beginning in the eighties, he has begun doing research on social and economic problems in China. In his paper "Quantitative Methods in Social Science Research", he clearly points out that "quantitative abstraction of the problems studied in social phenomena, and the use of quantitative methods to describe their state and processes show an increase in the human thought capability. It is one of he characteristics of the modernization of social science." He also points out that "we must make the transition in social science from a descriptive science to a precision science". These scientific ideas have brought a heated reaction in China's social sciences. Later, he also directed Hua Dachuan and others in using quantitative methods to study the financial subsidies, commodity prices and wage restructuring proposed by the State Commission for Restructuring the Economy. After more than a year, they established the mathematical model for this system, and simulated 85 different policies, providing scientific basis for this commission. This was also an excellent beginning for cooperative efforts by social scientists and natural scientists to solve problems in the restructuring of the economy.

In the past twenty some years, Song Jian's achievements have been astonishing and respectable. Our young republic is very proud to have produced a young honorable and talented scientist such as Song Jian!